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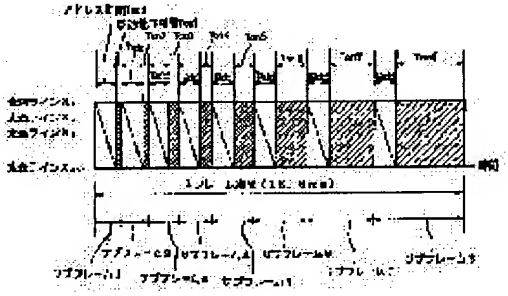
(54) ELECTRIC FIELD LIGHT EMISSION DISPLAY DEVICE AND ITS DRIVING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide the driving method for the electric field light emission display device which can make a gradational display with controllability and be driven with low power consumption.

SOLUTION: One frame period of the electric field light emission device which has electric field light emission elements arranged in matrix and selection transistors and driving transistors of the electric field light emission elements connected is divided into eight subframes 1 to 8. Those subframes are so set that they consist of different display discharge times Ton by the respective subframes 1 to 8 and an address period Tadd of the same time among all the subframes 1 to 8. Consequently, total light emission times by pixels can be made different according to whether pixels are selected in the eight subframes 1 to 8, thereby enabling gradational representation.



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CLAIMS

[Claim(s)]
[Claim 1] Two or more electroluminescence devices which have the electrode of a pair, respectively and emit light according to impression of an electrical potential difference, It connects with one each of the electrode of said pair of each of said electroluminescence devices. Two or more 1st switching circuits which output either a touch-down electrical potential difference or the driver voltage of a fixed electrical-potential-difference value to the electroluminescence devices which should emit light at each luminescence setting period corresponding to said each address period at each address period, The electroluminescence display characterized by providing the 2nd switching circuit which is connected to each of another side of the electrode of said pair of each of said electroluminescence devices, and outputs another side of said touch-down electrical potential difference or said driver voltage to said all electroluminescence devices at said each luminescence setting period.
[Claim 2] two or more luminescence setting periods which are the time amount of die length which said electroluminescence devices are arranged in the shape of a matrix, and is mutually [an one frame period is equivalent to said two or more address periods and each address period, respectively, and] different -- since -- the electroluminescence display according to claim 1 characterized by becoming.
[Claim 3] The selection transistor by which the drain electrode was connected to the signal line to which, as for said 1st switching circuit, a gate electrode is connected to the scan line to which a scan electrical potential difference is supplied, and a signal level is supplied, While a gate electrode is connected to the source electrode of said selection transistor and a drain electrode is connected to said electroluminescence devices The electroluminescence display according to claim 1 or 2 characterized by having the drive transistor by which the source electrode was connected to the drive power source which outputs either touch-down or said driver voltage.
[Claim 4] Said scan electrical potential difference and said signal level are an electroluminescence display according to claim 3 characterized by being the ON according to each property / off binary signal.
[Claim 5] The electroluminescence display according to claim 1 to 4 characterized by inputting ON / off binary signal in said 2nd switching circuit.
[Claim 6] The ratio of the die length of the time amount of each of said luminescence setting period is an electroluminescence display according to claim 1 to 5 characterized by being either of the n-th power (n being zero or more integers) of 2, respectively.
[Claim 7] The drive approach of the electroluminescence display characterized by to have the driver voltage days of supply which supply driver voltage to said electroluminescence devices which were equipped with two or more address periods when an one frame period chooses said electroluminescence devices of arbitration, respectively in the drive approach of an electroluminescence display of having two or more electroluminescence devices which emit light according to impression of an electrical potential difference, and were chosen in the address period concerned after each of said address period, and which were set as the time amount of mutually different die length.
[Claim 8] Said two or more electroluminescence devices have the electrode of a pair, respectively, and one side of the electrode of said pair of two or more of said electroluminescence devices is connected to two or more 1st switching circuits corresponding to each. Another side of the electrode of said pair of two or more of said electroluminescence devices is connected to the 2nd switching circuit, respectively. Said 1st switching circuit Said electroluminescence devices are chosen for said every address period, and either a touch-down electrical potential difference or the driver voltage of a fixed electrical-potential-difference value is outputted. Said 2nd switching circuit Said touch-down electrical potential difference or said driver voltage is the drive approach of the electroluminescence display according to claim 7 characterized by outputting another side either to said driver voltage days of supply corresponding to said each address period for the electroluminescence devices chosen according to said each address period.
[Claim 9] It is the drive approach of the electroluminescence display according to claim 8 characterized by to have the drive transistor whose source electrode a selection transistor [to which the drain electrode was connected to the signal line to which a gate electrode is connected to the scan line to which, as for said 1st switching circuit, a scan electrical

potential difference is supplied, and a signal level is supplied], and gate electrode is connected to the source electrode of said selection transistor, a drain electrode is connected to said electroluminescence devices, and inputs either said touch-down electrical potential difference or said driver voltage.
[Claim 10] Said scan electrical potential difference, said signal level, and said 2nd switching circuit are the drive approach of the electroluminescence display according to claim 9 characterized by inputting the ON according to each property / off binary signal.
[Claim 11] It is the drive approach of an electroluminescence display according to claim 7 to 10 that said electroluminescence devices are arranged in the shape of a matrix, and said one-frame period is characterized by setting up said address period and driver voltage days of supply by turns.
[Claim 12] The ratio of the die length of the time amount of each of said driver voltage days of supply is the drive approach of the electroluminescence display according to claim 7 to 11 characterized by being either of the n-th power (n being zero or more integers) of 2, respectively.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the drive approach of a display of performing electroluminescence luminescence, in more detail about an electroluminescence display and its drive approach.
[0002]
[Description of the Prior Art] Conventionally, there is an organic electroluminescence display (electroluminescence display) of the structure which equipped 1 pixel as shown in drawing 10 with two thin film transistors (henceforth TFT). In this organic electroluminescence display, as shown in this drawing, the channel resistance of the drive TFT2 which leads to an organic EL device 1 and a serial was indicated by gradation because selection TFT3 writes in that gate bias. Here, if selection TFT3 is chosen in a scan line Xm, the signal to write in will be supplied from a signal line Yn. Drawing 11 is a graph which shows the relation of the gate voltage (Vg) and channel resistance of drive TFT2 which were written in in this way, and the static characteristic of the so-called field-effect transistor (FET). Drawing 12 is the representative circuit schematic showing the relation between the organic EL device 1 and the armature-voltage control means Vc in 1 pixel, and all the pixel common EL power sources 4. This armature-voltage control means Vc consists of a selection transistor 3 and a drive transistor 2.
[0003]
[Problem(s) to be Solved by the Invention] At the organic electroluminescence display of the above-mentioned conventional 1-pixel 2 cel TFT structure, gradation is expressed by changing the luminescence brightness of Pixel EL by changing the current which flows to a channel by change of the gate bias of drive TFT2. For this reason, when it is going to realize 256 gradation, for example, it must be within limits as which the property variation in the linearity field of the drive TFT2 of each pixel in a panel is required of control of 256 gradation, but manufacture of the TFT panel of such a uniform property has the problem that implementation is difficult.
[0004] This Object of the Invention is in the point what kind of means should be provided for acquiring the drive approach of the electroluminescence display in which low-power actuation is possible while being able to perform the gradation display with a sufficient controllability.
[0005]
[Means for Solving the Problem] Two or more electroluminescence devices which invention according to claim 1 is an electroluminescence display, have the electrode of a pair, respectively, and emit light according to impression of an electrical potential difference, It connects with one each of the electrode of said pair of each of said electroluminescence devices. Two or more 1st switching circuits which output either a touch-down electrical potential difference or the driver voltage of a fixed electrical-potential-difference value to the electroluminescence devices which should emit light at each luminescence setting period corresponding to said each address period at each address period, It connects with each of another side of the electrode of said pair of each of said electroluminescence devices, and is characterized by providing the 2nd switching circuit which outputs another side of said touch-down electrical potential difference or said driver voltage to said all electroluminescence devices at said each luminescence setting period.
[0006] In invention according to claim 1, since the electroluminescence devices which should emit light at each luminescence setting period are chosen beforehand and either a touch-down electrical potential difference or the driver voltage of a fixed electrical-potential-difference value is impressed to each corresponding address period, if another side of a touch-down electrical potential difference or driver voltage is impressed to another side of the electrode of the pair of all electroluminescence devices at each luminescence setting period, only selected electroluminescence devices can emit light at each luminescence setting period. Therefore, if it puts in another way by emitting light in electroluminescence devices alternatively during two or more luminescence setting periods, according to the total time amount of the selected luminescence setting period, the luminescence brightness on the appearance of each electroluminescence devices is controllable.

[0007] two or more luminescence setting periods when said electroluminescence devices are arranged in the shape of a matrix at, and invention according to claim 2 differs mutually [an one frame period is equivalent to said two or more address periods and each address period, respectively, and] and which are the time amount of die length -- since -- it is characterized by becoming. By invention according to claim 2, since the die length of the time amount of each luminescence setting period differs mutually, if the luminescence setting period according to gradation is chosen, each pixel can realize luminescence of many numbers of brightness gradation with the small number of selections in spite of the driver voltage of a fixed electrical-potential-difference value at an one-frame period.
[0008] Invention according to claim 3 said 1st switching circuit The selection transistor by which the drain electrode was connected to the signal line to which a gate electrode is connected to the scan line to which a scan electrical potential difference is supplied, and a signal level is supplied, While a gate electrode is connected to the source electrode of said selection transistor and a drain electrode is connected to said electroluminescence devices, it is characterized by having the drive transistor by which the source electrode was connected to the drive power source which outputs either touch-down or said driver voltage. In invention according to claim 3, it is chargeable so that either a touch-down electrical potential difference or the driver voltage of a fixed electrical-potential-difference value can be easily impressed to the electroluminescence devices chosen as the address period during a luminescence setting period.
[0009] Invention according to claim 4 is characterized by said scan electrical potential differences and said signal levels being the ON according to each property / off binary signal. Moreover, invention according to claim 5 is characterized by inputting ON / off binary signal in said 2nd switching circuit.
[0010] Since a scan electrical potential difference, a signal level, and the 2nd switching circuit can control by the binary signal of ON/OFF, if the electrical potential difference of a saturation current field is impressed even if some dispersion is in a selection transistor, a drive transistor, and the V-I property of the 2nd switching circuit, brightness gradation is controllable by claim 4 and invention according to claim 5 good.
[0011] Invention according to claim 6 is characterized by the ratio of the die length of the time amount of each of said luminescence setting period being either of the n-th power (n being zero or more integers) of 2, respectively.
[0012] In the drive approach of an electroluminescence display of having two or more electroluminescence devices to which invention according to claim 7 emits light according to impression of an electrical potential difference An one-frame period is equipped with two or more address periods which choose said electroluminescence devices of arbitration, respectively. And it is characterized by having the driver voltage days of supply which supply driver voltage to said electroluminescence devices chosen in the address period concerned after said each address period and which were set as the time amount of mutually different die length.
[0013] Although the electroluminescence devices which should emit light at the next driver voltage days of supply are beforehand chosen as each address period and it is made to emit light in invention according to claim 7 at the driver voltage days of supply, since the die length of the time amount of each driver voltage days of supply differs mutually, if each pixel chooses the driver voltage days of supply according to gradation, luminescence of many numbers of brightness gradation is realizable by little selection at an one-frame period in spite of the driver voltage of a fixed electrical-potential-difference value.
[0014]
[Embodiment of the Invention] It explains based on the operation gestalt which shows the detail of the drive approach of the electroluminescence display concerning this invention hereafter to a drawing. In addition, the initiative is taken in explanation of the drive approach, and the configuration of an electroluminescence display is explained. Drawing 1 is the drive circuit diagram of the electroluminescence display concerning this operation gestalt. As shown in this drawing, the organic EL device 101 as electroluminescence devices is formed in each pixel field arranged in the shape of an X-Y matrix. These pixel fields are formed in the part which two or more scan line X and two or more signal-line Y intersect, respectively. The selection transistor Q1 connected to scan line X and signal-line Y and the drive transistor Q2 by which the gate was connected to this selection transistor Q1 are formed in one pixel field. This drive transistor Q2 is connected to one electrode of an organic EL device 101. And if the selection transistor Q1 is chosen and a driving signal is outputted from signal-line Y, it is set up so that the drive transistor Q2 may be turned on. This driving signal is a binary signal of ON/OFF. In addition, by the OFF state, as for the drive transistor Q2, the property is set up so that it is high resistance enough compared with an organic EL device 101, and can ignore compared with an organic EL device 101 in an ON state and may become low resistance enough.
[0015] Drawing 2 is the representative circuit schematic of the 1-pixel part of this electroluminescence display. It connects with one electrode of an organic EL device 101, and the switch S1 shown in this drawing is in the condition which has closed this switch S1, and luminescence of an organic EL device 101 of it is attained. Moreover, a switch S2 can follow the luminescence time amount within the subframe period which carries out a postscript, and can turn on / turn off all pixels at coincidence while connecting with the electrode side of another side of an organic EL device 101 and using it common to all pixels. In addition, the drive power source fixed to the fixed electrical potential difference is

shown by the inside Ps of drawing 2 .
[0016] Here, the still more concrete configuration of the electroluminescence display in this operation gestalt is explained using drawing 3 and drawing 4 . Drawing 3 is the top view showing the 1-pixel part of the electroluminescence display in this operation gestalt. Drawing 4 is the A-A sectional view of drawing 3 . 100 in drawing shows the electroluminescence display.
[0017] One gate electrode 103A of the selection transistor Q1, and gate electrode 103B and ** of the drive transistor Q2 are formed in two or more scan lines 103 which make parallel and regular intervals along the predetermined direction (the direction of X) where it comes to carry out patterning of the gate metal film which becomes with aluminum (aluminum), and this scan line 103 on the substrate 102 with which the electroluminescence display 100 of this operation gestalt consists of glass or a resin film. In addition, the oxide film on anode 104 is formed in the front face of these gates electrodes 103A and 103B and a scan line 103. Moreover, on these scan lines 103, the gate electrodes 103A and 103B, and a substrate 102, the gate dielectric film 105 which becomes with silicon nitride is formed. Furthermore, on the upper gate dielectric film 105A and 105B of the gate electrodes 103A and 103B, pattern formation of the semi-conductor layers 106A and 106B which become with an amorphous silicon (a-Si) is carried out. Moreover, the blocking layers 107A and 107B formed along the channel width direction are formed in the center of each semi-conductor layer 106A and 106B. And on semi-conductor layer 106A, the ohmic layers 108A and 108A divided into the source and drain side on blocking layer 107A are formed. Furthermore, in the selection transistor Q1, source electrode 109B which a laminating is carried out to signal-line 109A which a laminating is carried out to ohmic layer 108A by the side of a drain, and is connected, and ohmic layer 108A by the side of the source, and is connected is formed. This source electrode 109B is connected to gate dielectric film 105 to gate electrode 103B of the drive transistor Q2 through the contact hole 110 which carried out opening, as shown in drawing 3 . In the drive transistor Q2, the drain electrode 112 which the laminating of the end is carried out to ohmic layer 108B by the side of a drain, and it connects with the GND line 111 which a laminating is carried out to ohmic layer 108B by the side of the source, and connects, and the other end connects to the cathode electrode 114 of an organic EL device 101 which carries out a postscript is formed. These selection transistor Q1 and the drive transistor Q2 constitute the switch S1 shown in drawing 2 . Moreover, a capacitor Cp1 consists of gate electrode 103B, gate dielectric film 105, and a GND line.
[0018] Next, the configuration of an organic EL device 101 is explained. First, on the above-mentioned selection transistor Q1, the drive transistor Q2, and gate dielectric film 105, it continued throughout the luminescence viewing area of the electroluminescence display 100, and the interlayer insulation film 113 has accumulated. And contact hole 113A is formed in the interlayer insulation film 113 on the edge of the drain electrode 112 of the above-mentioned drive transistor Q2. In addition, with this operation gestalt, the edge of the drain electrode 112 of the drive transistor Q2 is set up so that it may be located in the center of abbreviation of a 1-pixel field. And on the interlayer insulation film 113, the cathode electrode 114 which becomes by MgIn continues throughout the 1 pixel field of abbreviation, and is formed in the shape of a rectangle. namely, the field (1-pixel field) surrounded in the scan lines 103 and 103 which adjoin the signal lines 109A and 109A which the cathode electrode 114 adjoins -- an abbreviation wrap -- it is formed like. For this reason, the selection transistor Q1 and the drive transistor Q2 are extensively covered with the cathode electrode 114.
[0019] Furthermore, as shown in drawing 4 , on the cathode electrode 114 by which pattern formation was carried out for every pixel, and the interlayer insulation film 113, the organic electroluminescence layer 115 continues throughout a luminescence viewing area, and is formed. Furthermore, on the organic electroluminescence layer 115, the anode electrode 116 which becomes by transparent ITO continues throughout the luminescence viewing area of all the organic EL devices 101, and is formed. Moreover, the anode electrode 116 of each organic EL device 101 is connected to the drive power source Ps which supplies driver voltage Vdd through a switch S2.
[0020] Here, an operation of the electroluminescence display 100 of a configuration of having described above is explained. the field (1-pixel field) surrounded in the scan lines 103 and 103 where the cathode electrode 114 adjoins the signal lines 109A and 109A which adjoin each other in this operation gestalt -- an abbreviation wrap -- since it is formed like, an organic EL device 101 can emit light by continuing throughout the abbreviation for a 1-pixel field. Moreover, since the cathode electrode 114 is formed by MgIn which has light reflex nature, when driver voltage is impressed between the cathode electrode 114 and the anode electrode 116, outgoing radiation of the display light generated in the organic electroluminescence layer 115 is carried out to the anode electrode 116 side, without leaking below (glass substrate 102 side). For this reason, it can prevent that light carries out incidence unnecessarily to the semi-conductor layers 106A and 106B of the selection transistor Q1 and the drive transistor Q2, and can avoid that malfunction by the photoelectromotive force of each transistor arises. Moreover, since outgoing radiation of the display light is carried out from the transparent anode electrode 116 side, light absorption of it is not carried out with a glass substrate 102 etc., and outgoing radiation is carried out in the condition that brightness is high.
[0021] Next, the drive circuit system of the electroluminescence display 100 of this operation gestalt is explained. As

shown in the representative circuit schematic of drawing 2 , EL display circuit of a 1-pixel part consists of an organic EL device 101, switches S1 and S2, and a drive power source Ps. Moreover, as described above, a switch S1 consists of a selection transistor Q1 and a drive transistor Q2, and can supply touch-down potential to an organic EL device 101 alternatively (output). In the organic EL device 101, the drive power source Ps which supplies the driver voltage Vdd of the fixed electrical-potential-difference value of straight polarity to an anode electrode side is connected, a switch S1 is connected to the cathode electrode side, and the source electrode side of the drive transistor Q2 which constitutes a switch S1 is grounded through the GND line 111.

[0022] Hereafter, the drive approach of the electroluminescence display 100 of this operation gestalt is explained. First, this operation gestalt sets the number of 480 and signal-line 109A for the number of the scan line 103 in the electroluminescence display 100 to 640. And with this operation gestalt, gradation means of displaying as shown in drawing 5 is used. An one-frame period is divided at eight subframe periods (subframes 1-8) noting that an one-frame period (period describing the display of one sheet) is 16.6ms immobilization, as shown in this drawing. Each subframe period consists of an address period Tadd for performing address writing, and the driver voltage days of supply 1-Ton 8 corresponding to an address period. if the ratio of these driver voltage days of supply Ton sets Ton1 to 1 (= 20) -- Ton2 -- 2 (= 21) and Ton3 -- 32 (= 25) and Ton7 are set to 64 (= 26), and Ton8 is set [4 (= 22) and Ton4 / 8 (= 23) and Ton5] to 128 (= 27) by 16 (= 24) and Ton6. In such the driver voltage days of supply, supposing it displays the brightness 1, in the driver voltage days of supply of 1, the brightness of 1 will be obtained by turning on only a subframe 1. At the time of brightness 2, it becomes possible [displaying a total of 256 (= 28) gradation with combination like the following] as a subframe 1 and a subframe 2 are turned on at the time of brightness 3 and only a subframe 3 is turned on only for a subframe 2 at the time of 4.

[0023] After address writing is completed at the address period Tadd, coincidence is made to turn on the pixel to which between address selection of the driver voltage days of supply Ton was made in each subframe. Coincidence is made to turn on the pixel by which performed address rewriting and address selection was made during the address period Tadd at the driver voltage days of supply Ton in the following subframe. Thus, it carries out within an one-frame period from a subframe 1 to a subframe 8. The timing of address selection can be controlled by the switch S1 shown in drawing 2 , and driver voltage supply time amount can be controlled by ON time amount of a switch S2. That is, the selection transistor Q1 of the pixel which should be turned on to a display conducting period peculiar to this subframe will be in an ON state by line sequential scanning of a scan line and a signal line within one subframe period. And if the selection transistor Q1 is turned on, the writing to the gate electrode of the drive transistor Q2 will be performed through the selection transistor Q1 from a signal line, and the condition that the channel was formed in the drive transistor Q2 within the address period Tadd is held. After all the pixels that should be turned on in this address period are chosen, a selection condition is held till the driver voltage days of supply Ton after address period Tadd termination. During the driver voltage days of supply Ton, the drive power source Ps connected to the anode electrode 116 is turned on with a switch S2. As these driver voltage days of supply were described above, that die length is set up by each subframe. Here, if the die length of the time amount of all the address periods Tadd in an one-frame period and the die length of the time amount of the driver voltage days of supply Ton1-Ton8 are made equal, each address period Tadd will be set to about 1.04ms, and the time amount chosen in 1 driver-voltage days of supply of each scan lines X1-X480 will be set to about 2.2 microseconds.

[0024] Next, the principle which can perform a gradation display is explained using drawing 6 by the drive approach of this operation gestalt. Since this drawing simplified, it is the example which divided the one-frame period into three subframes, and, in the driver voltage days of supply (luminescence time amount) of a subframe 1, 1 (= 20) and the driver voltage days of supply of a subframe 2 made [2 (= 21) and the driver voltage days of supply of a subframe 3] it 4 (= 22). Drawing 6 shows the example displayed that the brightness of the pixels 13, 22, 24, 31, 35, 42, 44, and 53 of the part which attached the reticulated slash becomes high. Supposing all pixels are chosen by the subframe 1 and it specifically emits light in brightness 1, in subframes 2 and 3, only pixels 13, 22, 24, 31, 35, 42, 44, and 53 will be chosen by line sequential scanning, and it will set up that brightness 2 and brightness 4 were added. For this reason, where three subframes are completed (the one-frame period expired), pixels 13, 22, 24, 31, 35, 42, 44, and 53 serve as brightness 7, and other pixels serve as high brightness as compared with being brightness 1. Thus, since the ratio of the address period sum total and a driver voltage supply term suitable distance meter is changeable by dividing an one-frame period into two or more subframes, the gradation display of the electroluminescence display 100 is attained. Moreover, if it sets up so that the most efficient electrical-potential-difference value may be used for a luminescence drive in the electrical-potential-difference-brightness-effectiveness property of the organic EL device shown in drawing 7 , a luminescence drive can be carried out with a low power. Such a principle can be similarly applied, when an one-frame period is divided into eight subframes, and the expression of 256 gradation of it is also attained.

[0025] As described above, according to this operation gestalt, the switch S2 which controls switching of the fixed driver voltage Vdd by ON / off binary signal is used. And since either is alternatively outputted for the binary signal of

ON/OFF also to the selection transistor Q1 and the drive transistor Q2 and the electrical potential difference VSD between source drains of drawing 10 is set as the range in which the current between source drains turns into the saturation current Even if some dispersion is in the V-I property between 1V - 5V of the electrical potential difference VSD of each transistor, brightness gradation can be controlled good and it becomes possible to perform stable gradation control. Although there is a possibility that a gap of each slight electrical characteristics may be multiplied, and brightness gradation may shift and make it large as one pixel when the selection transistor Q1, the drive transistor Q2, and three switching elements of a switch S2 constitute to one organic EL device especially In order that they may only perform ON / off control using the electrical-potential-difference value in a saturation current field, the selection transistor Q1, the drive transistor Q2, and a switch S2 have the advantage of the being hard to be influenced, even when some variations are in a property. Moreover, since an electrical-potential-difference value with the sufficient luminous efficiency for an organic EL device 101 can be set up as driver voltage, low-power-ization can be attained.

[0026] As mentioned above, although this operation gestalt was explained, various kinds of design changes which are not limited to this and accompany the summary of a configuration are possible for this invention. For example, in the above-mentioned operation gestalt, although it considered as the configuration equipped with the selection transistor Q1 and the drive transistor Q2 in order to hold an address selection condition within the address period in a subframe period, an address selection condition can be held also as a configuration as shown in the 1-pixel equal circuit of drawing 8 . In this drawing, in Q3, a selection transistor and Q4 show a drive transistor, and Cp2 shows capacity. In addition, since capacity Cp2 is connected separately, this drive transistor Q4 can use TFT which does not have an EEPROM function. One side of the source drain of the drive transistor Q4 is connected to each cathode electrode of each organic EL device 101, and it connects with DC-power-supply Ps' to which another side supplies negative potential Vdd' through a switch S2. The anode electrode which continued throughout the luminescence viewing area and was formed is grounded, it is structure and the drive transistor Q4 is chosen, and if a switch S2 turns on an organic EL device 101, it will emit light. Moreover, in the above-mentioned operation gestalt, although it is effective in especially the organic EL device 101 that can emit light by direct-current electric field as electroluminescence devices, of course, it is also possible to apply an inorganic EL element and other electroluminescence devices. With this operation gestalt, the luminous layer of an organic EL device may consist of organic layers more than two-layer [from which charge transportability differs], and may prepare the closure layer which prevents invasion of oxygen and water on the anode electrode 116. Moreover, it is good also as structure which carried out the laminating to the order of the anode electrode 116, the organic electroluminescence layer 115, and the cathode electrode 114 from the substrate 102 side.

[0027] In addition, with this operation gestalt, although the die length of the time amount of all the address periods Tadd in an one-frame period and the die length of the time amount of the driver voltage days of supply Ton1-Ton8 were made equal, according to the property of the selection transistors Q1 and Q3 and the drive transistors Q2 and Q4, one side of the address period Tadd and the driver voltage days of supply Ton may be lengthened, or another side may be shortened. moreover -- although each driver voltage days of supply Ton are impressed to short order (Ton1, Ton2, --, Ton8) -- not only this but long order (Ton8, Ton7, --, Ton1) -- you may not be as the sequence of the die length of time amount like [it is good or] the order of Ton8, Ton1, Ton5, Ton4, Ton7, Ton2, Ton6, and Ton3. Moreover, the driver voltage Vdd which the drive power source Ps supplies is the alternating current with direct current voltage. Furthermore, if the numbers of gradation are not only 256 gradation but two or more gradation, even if there are than 256 gradation, they are good at least. [more]

[0028] Although the switch S1 which consists of a selection transistor Q1 and a drive transistor Q2 is connected to the GND line 111 and the switch S2 switch on at the driver voltage days of supply T is connected to the drive power source Ps with this operation gestalt As shown in drawing 9 , the switch S2 by the side of the anode electrode of an organic EL device 101 is grounded directly, without minding the drive power source Ps. The drive transistor Q2 of the switch S1 by the side of the cathode electrode of an organic EL device 101 may be connected to drive power-source Ps' which supplies driver voltage Vdd' of the constant value of negative polarity instead of the GND line 111. Even if it is this case, either of the binary signals is outputted to scan line X and signal-line Y, respectively, the switch S2 connected to the anode electrode of an organic EL device 101 can be turned on by the binary signal, and OFF control can be carried out. That is, driver voltage Vdd' is supplied to the cathode electrode side of the selected organic EL device 101, all the switches S2 are turned on at the driver voltage days of supply Ton, the anode electrode of an organic EL device 101 is grounded, and light is emitted at the address period Tadd.

[0029] Furthermore, with this operation gestalt, although the organic EL device 101 was formed above the switch S1, you may form on the same flat surface as a switch S1. In addition, in this case, if a laminating is carried out to the order of the anode electrode 116, the organic electroluminescence layer 115, and the cathode electrode 114 and it forms in it from a substrate 102 side, the cathode electrode 114 which consists of an ingredient of a work function which is easy to oxidize low will not be degraded with the formation process of the anode electrode 116 and the organic

electroluminescence layer 115.
[0030]
[Effect of the Invention] According to this invention, the effectiveness an electroluminescence display gives a gradation indication of the controllability of enabling low-power actuation is both done so so that clearly from the above explanation.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to the drive approach of a display of performing electroluminescence luminescence, in more detail about an electroluminescence display and its drive approach.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Conventionally, there is an organic electroluminescence display (electroluminescence display) of the structure which equipped 1 pixel as shown in drawing 10 with two thin film transistors (henceforth TFT). In this organic electroluminescence display, as shown in this drawing, the channel resistance of the drive TFT2 which leads to an organic EL device 1 and a serial was indicated by gradation because selection TFT3 writes in that gate bias. Here, if selection TFT3 is chosen in a scan line Xm, the signal to write in will be supplied from a signal line Yn. Drawing 11 is a graph which shows the relation of the gate voltage (Vg) and channel resistance of drive TFT2 which were written in in this way, and the static characteristic of the so-called field-effect transistor (FET). Drawing 12 is the representative circuit schematic showing the relation between the organic EL device 1 and the armature-voltage control means Vc in 1 pixel, and all the pixel common EL power sources 4. This armature-voltage control means Vc consists of a selection transistor 3 and a drive transistor 2.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, the effectiveness an electroluminescence display gives a gradation indication of the controllability of enabling low-power actuation is both done so so that clearly from the above explanation.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] At the organic electroluminescence display of the above-mentioned conventional 1-pixel 2 cel TFT structure, gradation is expressed by changing the luminescence brightness of Pixel EL by changing the current which flows to a channel by change of the gate bias of drive TFT2. For this reason, when it is going to realize 256 gradation, for example, it must be within limits as which the property variation in the linearity field of the drive TFT2 of each pixel in a panel is required of control of 256 gradation, but manufacture of the TFT panel of such a uniform property has the problem that implementation is difficult.
[0004] This Object of the Invention is in the point what kind of means should be provided for acquiring the drive approach of the electroluminescence display in which low-power actuation is possible while being able to perform the gradation display with a sufficient controllability.

[Translation done.]

MEANS

[Means for Solving the Problem] Two or more electroluminescence devices which invention according to claim 1 is an electroluminescence display, have the electrode of a pair, respectively, and emit light according to impression of an electrical potential difference, It connects with one each of the electrode of said pair of each of said electroluminescence devices. Two or more 1st switching circuits which output either a touch-down electrical potential difference or the driver voltage of a fixed electrical-potential-difference value to the electroluminescence devices which should emit light at each luminescence setting period corresponding to said each address period at each address period, It connects with each of another side of the electrode of said pair of each of said electroluminescence devices, and is characterized by providing the 2nd switching circuit which outputs another side of said touch-down electrical potential difference or said driver voltage to said all electroluminescence devices at said each luminescence setting period.
[0006] In invention according to claim 1, since the electroluminescence devices which should emit light at each luminescence setting period are chosen beforehand and either a touch-down electrical potential difference or the driver voltage of a fixed electrical-potential-difference value is impressed to each corresponding address period, if another side of a touch-down electrical potential difference or driver voltage is impressed to another side of the electrode of the pair of all electroluminescence devices at each luminescence setting period, only selected electroluminescence devices can emit light at each luminescence setting period. Therefore, if it puts in another way by emitting light in electroluminescence devices alternatively during two or more luminescence setting periods, according to the total time amount of the selected luminescence setting period, the luminescence brightness on the appearance of each electroluminescence devices is controllable.
[0007] two or more luminescence setting periods when said electroluminescence devices are arranged in the shape of a matrix at, and invention according to claim 2 differs mutually [an one frame period is equivalent to said two or more address periods and each address period, respectively, and] and which are the time amount of die length -- since -- it is characterized by becoming. By invention according to claim 2, since the die length of the time amount of each luminescence setting period differs mutually, if the luminescence setting period according to gradation is chosen, each pixel can realize luminescence of many numbers of brightness gradation with the small number of selections in spite of the driver voltage of a fixed electrical-potential-difference value at an one-frame period.
[0008] Invention according to claim 3 said 1st switching circuit The selection transistor by which the drain electrode was connected to the signal line to which a gate electrode is connected to the scan line to which a scan electrical potential difference is supplied, and a signal level is supplied, While a gate electrode is connected to the source electrode of said selection transistor and a drain electrode is connected to said electroluminescence devices, it is characterized by having the drive transistor by which the source electrode was connected to the drive power source which outputs either touch-down or said driver voltage. In invention according to claim 3, it is chargeable so that either a touch-down electrical potential difference or the driver voltage of a fixed electrical-potential-difference value can be easily impressed to the electroluminescence devices chosen as the address period during a luminescence setting period.
[0009] Invention according to claim 4 is characterized by said scan electrical potential differences and said signal levels being the ON according to each property / off binary signal. Moreover, invention according to claim 5 is characterized by inputting ON / off binary signal in said 2nd switching circuit.
[0010] Since a scan electrical potential difference, a signal level, and the 2nd switching circuit can control by the binary signal of ON/OFF, if the electrical potential difference of a saturation current field is impressed even if some dispersion is in a selection transistor, a drive transistor, and the V-I property of the 2nd switching circuit, brightness gradation is controllable by claim 4 and invention according to claim 5 good.
[0011] Invention according to claim 6 is characterized by the ratio of the die length of the time amount of each of said luminescence setting period being either of the n-th power (n being zero or more integers) of 2, respectively.
[0012] In the drive approach of an electroluminescence display of having two or more electroluminescence devices to which invention according to claim 7 emits light according to impression of an electrical potential difference An one-

frame period is equipped with two or more address periods which choose said electroluminescence devices of arbitration, respectively. And it is characterized by having the driver voltage days of supply which supply driver voltage to said electroluminescence devices chosen in the address period concerned after said each address period and which were set as the time amount of mutually different die length.

[0013] Although the electroluminescence devices which should emit light at the next driver voltage days of supply are beforehand chosen as each address period and it is made to emit light in invention according to claim 7 at the driver voltage days of supply, since the die length of the time amount of each driver voltage days of supply differs mutually, if each pixel chooses the driver voltage days of supply according to gradation, luminescence of many numbers of brightness gradation is realizable by little selection at an one-frame period in spite of the driver voltage of a fixed electrical-potential-difference value.

[0014]

[Embodiment of the Invention] It explains based on the operation gestalt which shows the detail of the drive approach of the electroluminescence display concerning this invention hereafter to a drawing. In addition, the initiative is taken in explanation of the drive approach, and the configuration of an electroluminescence display is explained. Drawing 1 is the drive circuit diagram of the electroluminescence display concerning this operation gestalt. As shown in this drawing, the organic EL device 101 as electroluminescence devices is formed in each pixel field arranged in the shape of an X-Y matrix. These pixel fields are formed in the part which two or more scan line X and two or more signal-line Y intersect, respectively. The selection transistor Q1 connected to scan line X and signal-line Y and the drive transistor Q2 by which the gate was connected to this selection transistor Q1 are formed in one pixel field. This drive transistor Q2 is connected to one electrode of an organic EL device 101. And if the selection transistor Q1 is chosen and a driving signal is outputted from signal-line Y, it is set up so that the drive transistor Q2 may be turned on. This driving signal is a binary signal of ON/OFF. In addition, by the OFF state, as for the drive transistor Q2, the property is set up so that it is high resistance enough compared with an organic EL device 101, and can ignore compared with an organic EL device 101 in an ON state and may become low resistance enough.

[0015] Drawing 2 is the representative circuit schematic of the 1-pixel part of this electroluminescence display. It connects with one electrode of an organic EL device 101, and the switch S1 shown in this drawing is in the condition which has closed this switch S1, and luminescence of an organic EL device 101 of it is attained. Moreover, a switch S2 can follow the luminescence time amount within the subframe period which carries out a postscript, and can turn on / turn off all pixels at coincidence while connecting with the electrode side of another side of an organic EL device 101 and using it common to all pixels. In addition, the drive power source fixed to the fixed electrical potential difference is shown by the inside Ps of drawing 2 .

[0016] Here, the still more concrete configuration of the electroluminescence display in this operation gestalt is explained using drawing 3 and drawing 4 . Drawing 3 is the top view showing the 1-pixel part of the electroluminescence display in this operation gestalt. Drawing 4 is the A-A sectional view of drawing 3 . 100 in drawing shows the electroluminescence display.

[0017] One gate electrode 103A of the selection transistor Q1, and gate electrode 103B and ** of the drive transistor Q2 are formed in two or more scan lines 103 which make parallel and regular intervals along the predetermined direction (the direction of X) where it comes to carry out patterning of the gate metal film which becomes with aluminum (aluminum), and this scan line 103 on the substrate 102 with which the electroluminescence display 100 of this operation gestalt consists of glass or a resin film. In addition, the oxide film on anode 104 is formed in the front face of these gates electrodes 103A and 103B and a scan line 103. Moreover, on these scan lines 103, the gate electrodes 103A and 103B, and a substrate 102, the gate dielectric film 105 which becomes with silicon nitride is formed. Furthermore, on the upper gate dielectric film 105A and 105B of the gate electrodes 103A and 103B, pattern formation of the semi-conductor layers 106A and 106B which become with an amorphous silicon (a-Si) is carried out. Moreover, the blocking layers 107A and 107B formed along the channel width direction are formed in the center of each semi-conductor layer 106A and 106B. And on semi-conductor layer 106A, the ohmic layers 108A and 108A divided into the source and drain side on blocking layer 107A are formed. Furthermore, in the selection transistor Q1, source electrode 109B which a laminating is carried out to signal-line 109A which a laminating is carried out to ohmic layer 108A by the side of a drain, and is connected, and ohmic layer 108A by the side of the source, and is connected is formed. This source electrode 109B is connected to gate dielectric film 105 to gate electrode 103B of the drive transistor Q2 through the contact hole 110 which carried out opening, as shown in drawing 3 . In the drive transistor Q2, the drain electrode 112 which the laminating of the end is carried out to ohmic layer 108B by the side of a drain, and it connects with the GND line 111 which a laminating is carried out to ohmic layer 108B by the side of the source, and connects, and the other end connects to the cathode electrode 114 of an organic EL device 101 which carries out a postscript is formed. These selection transistor Q1 and the drive transistor Q2 constitute the switch S1 shown in drawing 2 . Moreover, a capacitor Cp1 consists of gate electrode 103B, gate dielectric film 105, and a GND line.

[0018] Next, the configuration of an organic EL device 101 is explained. First, on the above-mentioned selection transistor Q1, the drive transistor Q2, and gate dielectric film 105, it continued throughout the luminescence viewing area of the electroluminescence display 100, and the interlayer insulation film 113 has accumulated. And contact hole 113A is formed in the interlayer insulation film 113 on the edge of the drain electrode 112 of the above-mentioned drive transistor Q2. In addition, with this operation gestalt, the edge of the drain electrode 112 of the drive transistor Q2 is set up so that it may be located in the center of abbreviation of a 1-pixel field. And on the interlayer insulation film 113, the cathode electrode 114 which becomes by MgIn continues throughout the 1 pixel field of abbreviation, and is formed in the shape of a rectangle. namely, the field (1-pixel field) surrounded in the scan lines 103 and 103 which adjoin the signal lines 109A and 109A which the cathode electrode 114 adjoins -- an abbreviation wrap -- it is formed like. For this reason, the selection transistor Q1 and the drive transistor Q2 are extensively covered with the cathode electrode 114.

[0019] Furthermore, as shown in drawing 4 , on the cathode electrode 114 by which pattern formation was carried out for every pixel, and the interlayer insulation film 113, the organic electroluminescence layer 115 continues throughout a luminescence viewing area, and is formed. Furthermore, on the organic electroluminescence layer 115, the anode electrode 116 which becomes by transparent ITO continues throughout the luminescence viewing area of all the organic EL devices 101, and is formed. Moreover, the anode electrode 116 of each organic EL device 101 is connected to the drive power source Ps which supplies driver voltage Vdd through a switch S2.

[0020] Here, an operation of the electroluminescence display 100 of a configuration of having described above is explained. the field (1-pixel field) surrounded in the scan lines 103 and 103 where the cathode electrode 114 adjoins the signal lines 109A and 109A which adjoin each other in this operation gestalt -- an abbreviation wrap -- since it is formed like, an organic EL device 101 can emit light by continuing throughout the abbreviation for a 1-pixel field. Moreover, since the cathode electrode 114 is formed by MgIn which has light reflex nature, when driver voltage is impressed between the cathode electrode 114 and the anode electrode 116, outgoing radiation of the display light generated in the organic electroluminescence layer 115 is carried out to the anode electrode 116 side, without leaking below (glass substrate 102 side). For this reason, it can prevent that light carries out incidence unnecessarily to the semi-conductor layers 106A and 106B of the selection transistor Q1 and the drive transistor Q2, and can avoid that malfunction by the photoelectromotive force of each transistor arises. Moreover, since outgoing radiation of the display light is carried out from the transparent anode electrode 116 side, light absorption of it is not carried out with a glass substrate 102 etc., and outgoing radiation is carried out in the condition that brightness is high.

[0021] Next, the drive circuit system of the electroluminescence display 100 of this operation gestalt is explained. As shown in the representative circuit schematic of drawing 2 , EL display circuit of a 1-pixel part consists of an organic EL device 101, switches S1 and S2, and a drive power source Ps. Moreover, as described above, a switch S1 consists of a selection transistor Q1 and a drive transistor Q2, and can supply touch-down potential to an organic EL device 101 alternatively (output). In the organic EL device 101, the drive power source Ps which supplies the driver voltage Vdd of the fixed electrical-potential-difference value of straight polarity to an anode electrode side is connected, a switch S1 is connected to the cathode electrode side, and the source electrode side of the drive transistor Q2 which constitutes a switch S1 is grounded through the GND line 111.

[0022] Hereafter, the drive approach of the electroluminescence display 100 of this operation gestalt is explained. First, this operation gestalt sets the number of 480 and signal-line 109A for the number of the scan line 103 in the electroluminescence display 100 to 640. And with this operation gestalt, gradation means of displaying as shown in drawing 5 is used. An one-frame period is divided at eight subframe periods (subframes 1-8) noting that an one-frame period (period describing the display of one sheet) is 16.6ms immobilization, as shown in this drawing. Each subframe period consists of an address period Tadd for performing address writing, and the driver voltage days of supply 1-Ton 8 corresponding to an address period. if the ratio of these driver voltage days of supply Ton sets Ton1 to 1 (= 20) -- Ton2 -- 2 (= 21) and Ton3 -- 32 (= 25) and Ton7 are set to 64 (= 26), and Ton8 is set [4 (= 22) and Ton4 / 8 (= 23) and Ton5] to 128 (= 27) by 16 (= 24) and Ton6. In such the driver voltage days of supply, supposing it displays the brightness 1, in the driver voltage days of supply of 1, the brightness of 1 will be obtained by turning on only a subframe 1. At the time of brightness 2, it becomes possible [displaying a total of 256 (= 28) gradation with combination like the following] as a subframe 1 and a subframe 2 are turned on at the time of brightness 3 and only a subframe 3 is turned on only for a subframe 2 at the time of 4.

[0023] After address writing is completed at the address period Tadd, coincidence is made to turn on the pixel to which between address selection of the driver voltage days of supply Ton was made in each subframe. Coincidence is made to turn on the pixel by which performed address rewriting and address selection was made during the address period Tadd at the driver voltage days of supply Ton in the following subframe. Thus, it carries out within an one-frame period from a subframe 1 to a subframe 8. The timing of address selection can be controlled by the switch S1 shown in drawing 2 , and driver voltage supply time amount can be controlled by ON time amount of a switch S2. That is, the selection

transistor Q1 of the pixel which should be turned on to a display conducting period peculiar to this subframe will be in an ON state by line sequential scanning of a scan line and a signal line within one subframe period. And if the selection transistor Q1 is turned on, the writing to the gate electrode of the drive transistor Q2 will be performed through the selection transistor Q1 from a signal line, and the condition that the channel was formed in the drive transistor Q2 within the address period Tadd is held. After all the pixels that should be turned on in this address period are chosen, a selection condition is held till the driver voltage days of supply Ton after address period Tadd termination. During the driver voltage days of supply Ton, the drive power source Ps connected to the anode electrode 116 is turned on with a switch S2. As these driver voltage days of supply were described above, that die length is set up by each subframe. Here, if the die length of the time amount of all the address periods Tadd in an one-frame period and the die length of the time amount of the driver voltage days of supply Ton1-Ton8 are made equal, each address period Tadd will be set to about 1.04ms, and the time amount chosen in 1 driver-voltage days of supply of each scan lines X1-X480 will be set to about 2.2 microseconds.

[0024] Next, the principle which can perform a gradation display is explained using drawing 6 by the drive approach of this operation gestalt. Since this drawing simplified, it is the example which divided the one-frame period into three subframes, and, in the driver voltage days of supply (luminescence time amount) of a subframe 1, 1 (= 20) and the driver voltage days of supply of a subframe 2 made [2 (= 21) and the driver voltage days of supply of a subframe 3] it 4 (= 22). Drawing 6 shows the example displayed that the brightness of the pixels 13, 22, 24, 31, 35, 42, 44, and 53 of the part which attached the reticulated slash becomes high. Supposing all pixels are chosen by the subframe 1 and it specifically emits light in brightness 1, in subframes 2 and 3, only pixels 13, 22, 24, 31, 35, 42, 44, and 53 will be chosen by line sequential scanning, and it will set up that brightness 2 and brightness 4 were added. For this reason, where three subframes are completed (the one-frame period expired), pixels 13, 22, 24, 31, 35, 42, 44, and 53 serve as brightness 7, and other pixels serve as high brightness as compared with being brightness 1. Thus, since the ratio of the address period sum total and a driver voltage supply term suitable distance meter is changeable by dividing an one-frame period into two or more subframes, the gradation display of the electroluminescence display 100 is attained. Moreover, if it sets up so that the most efficient electrical-potential-difference value may be used for a luminescence drive in the electrical-potential-difference-brightness-effectiveness property of the organic EL device shown in drawing 7 , a luminescence drive can be carried out with a low power. Such a principle can be similarly applied, when an one-frame period is divided into eight subframes, and the expression of 256 gradation of it is also attained.

[0025] As described above, according to this operation gestalt, the switch S2 which controls switching of the fixed driver voltage Vdd by ON / off binary signal is used. And since either is alternatively outputted for the binary signal of ON/OFF also to the selection transistor Q1 and the drive transistor Q2 and the electrical potential difference VSD between source drains of drawing 10 is set as the range in which the current between source drains turns into the saturation current Even if some dispersion is in the V-I property between 1V - 5V of the electrical potential difference VSD of each transistor, brightness gradation can be controlled good and it becomes possible to perform stable gradation control. Although there is a possibility that a gap of each slight electrical characteristics may be multiplied, and brightness gradation may shift and make it large as one pixel when the selection transistor Q1, the drive transistor Q2, and three switching elements of a switch S2 constitute to one organic EL device especially In order that they may only perform ON / off control using the electrical-potential-difference value in a saturation current field, the selection transistor Q1, the drive transistor Q2, and a switch S2 have the advantage of the being hard to be influenced, even when some variations are in a property. Moreover, since an electrical-potential-difference value with the sufficient luminous efficiency for an organic EL device 101 can be set up as driver voltage, low-power-ization can be attained.

[0026] As mentioned above, although this operation gestalt was explained, various kinds of design changes which are not limited to this and accompany the summary of a configuration are possible for this invention. For example, in the above-mentioned operation gestalt, although it considered as the configuration equipped with the selection transistor Q1 and the drive transistor Q2 in order to hold an address selection condition within the address period in a subframe period, an address selection condition can be held also as a configuration as shown in the 1-pixel equal circuit of drawing 8 . In this drawing, in Q3, a selection transistor and Q4 show a drive transistor, and Cp2 shows capacity. In addition, since capacity Cp2 is connected separately, this drive transistor Q4 can use TFT which does not have an EEPROM function. One side of the source drain of the drive transistor Q4 is connected to each cathode electrode of each organic EL device 101, and it connects with DC-power-supply Ps' to which another side supplies negative potential Vdd' through a switch S2. The anode electrode which continued throughout the luminescence viewing area and was formed is grounded, it is structure and the drive transistor Q4 is chosen, and if a switch S2 turns on an organic EL device 101, it will emit light. Moreover, in the above-mentioned operation gestalt, although it is effective in especially the organic EL device 101 that can emit light by direct-current electric field as electroluminescence devices, of course, it is also possible to apply an inorganic EL element and other electroluminescence devices. With this operation gestalt, the luminous layer of an organic EL device may consist of organic layers more than two-layer [from

which charge transportability differs], and may prepare the closure layer which prevents invasion of oxygen and water on the anode electrode 116. Moreover, it is good also as structure which carried out the laminating to the order of the anode electrode 116, the organic electroluminescence layer 115, and the cathode electrode 114 from the substrate 102 side.

[0027] In addition, with this operation gestalt, although the die length of the time amount of all the address periods Tadd in an one-frame period and the die length of the time amount of the driver voltage days of supply Ton1-Ton8 were made equal, according to the property of the selection transistors Q1 and Q3 and the drive transistors Q2 and Q4, one side of the address period Tadd and the driver voltage days of supply Ton may be lengthened, or another side may be shortened. moreover -- although each driver voltage days of supply Ton are impressed to short order (Ton1, Ton2, --, Ton8) -- not only this but long order (Ton8, Ton7, --, Ton1) -- you may not be as the sequence of the die length of time amount like [it is good or] the order of Ton8, Ton1, Ton5, Ton4, Ton7, Ton2, Ton6, and Ton3. Moreover, the driver voltage Vdd which the drive power source Ps supplies is the alternating current with direct current voltage. Furthermore, if the numbers of gradation are not only 256 gradation but two or more gradation, even if there are than 256 gradation, they are good at least. [more]

[0028] Although the switch S1 which consists of a selection transistor Q1 and a drive transistor Q2 is connected to the GND line 111 and the switch S2 switch on at the driver voltage days of supply T is connected to the drive power source Ps with this operation gestalt As shown in drawing 9 , the switch S2 by the side of the anode electrode of an organic EL device 101 is grounded directly, without minding the drive power source Ps. The drive transistor Q2 of the switch S1 by the side of the cathode electrode of an organic EL device 101 may be connected to drive power-source Ps' which supplies driver voltage Vdd' of the constant value of negative polarity instead of the GND line 111. Even if it is this case, either of the binary signals is outputted to scan line X and signal-line Y, respectively, the switch S2 connected to the anode electrode of an organic EL device 101 can be turned on by the binary signal, and OFF control can be carried out. That is, driver voltage Vdd' is supplied to the cathode electrode side of the selected organic EL device 101, all the switches S2 are turned on at the driver voltage days of supply Ton, the anode electrode of an organic EL device 101 is grounded, and light is emitted at the address period Tadd.

[0029] Furthermore, with this operation gestalt, although the organic EL device 101 was formed above the switch S1, you may form on the same flat surface as a switch S1. In addition, in this case, if a laminating is carried out to the order of the anode electrode 116, the organic electroluminescence layer 115, and the cathode electrode 114 and it forms in it from a substrate 102 side, the cathode electrode 114 which consists of an ingredient of a work function which is easy to oxidize low will not be degraded with the formation process of the anode electrode 116 and the organic electroluminescence layer 115.

[Translation done.]

DESCRIPTION OF DRAWINGS

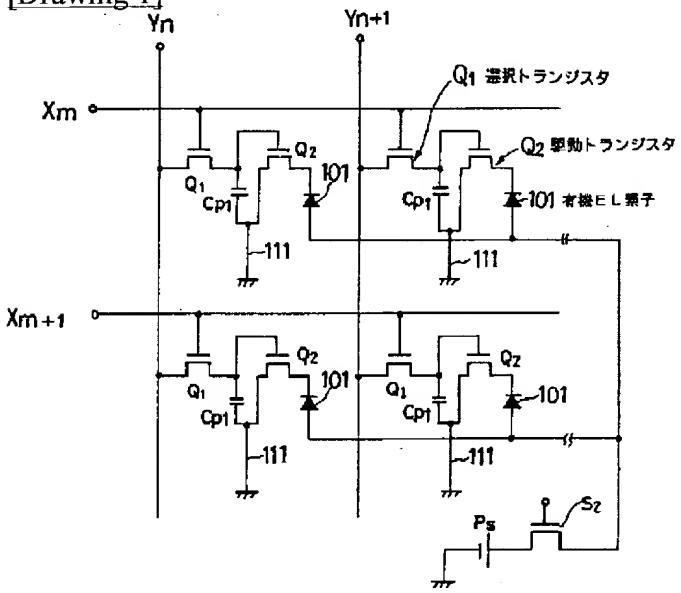
[Brief Description of the Drawings]
[Drawing 1] The drive circuit diagram of the electroluminescence display concerning the operation gestalt of this invention.
[Drawing 2] The representative circuit schematic of the 1-pixel part of the electroluminescence display in this operation gestalt.
[Drawing 3] The top view of the electroluminescence display in this operation gestalt.
[Drawing 4] The A-A sectional view of drawing 3 .
[Drawing 5] The drive approach **** explanatory view of this operation gestalt.
[Drawing 6] The explanatory view explaining the gradation display principle at the time of dividing an one-frame period into three subframes.
[Drawing 7] The graph which shows the electrical-potential-difference-brightness-effectiveness property of the organic EL device in this operation gestalt.
[Drawing 8] The representative circuit schematic showing the 1-pixel part of the electroluminescence display which can apply this invention.
[Drawing 9] It is the drive circuit diagram of an electroluminescence display to other operation gestalten of this invention.
[Drawing 10] The representative circuit schematic showing the 1-pixel part of the conventional electroluminescence display.
[Drawing 11] The graph which shows the relation of the gate voltage (Vg) and channel resistance of drive TFT2 in the conventional electroluminescence indicating equipment.
[Drawing 12] The representative circuit schematic showing the relation between the organic EL device 1 and the armature-voltage control means Vc in 1 pixel of the conventional electroluminescence display, and all the pixel common EL power sources 4.
[Description of Notations]
100 Electroluminescence Display
101 Organic EL Device
103 Scan Line
109A Signal line
Q1 Selection transistor
Q2 Drive transistor
S2 Switch

'* NOTICES *

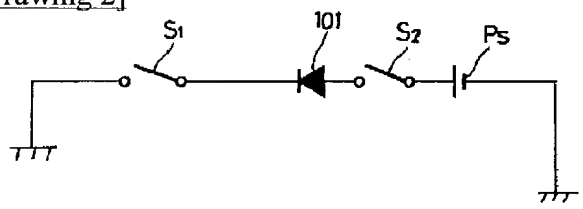
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

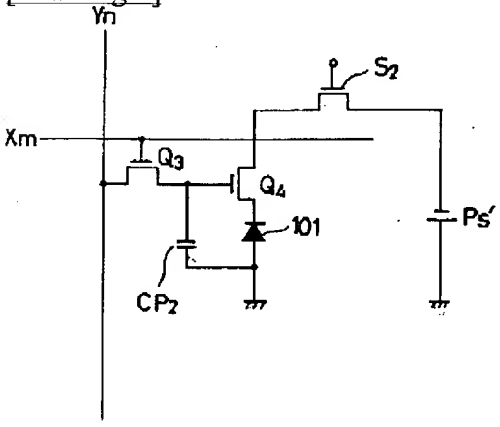
[Drawing 1]



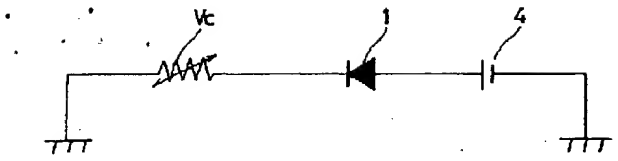
[Drawing 2]



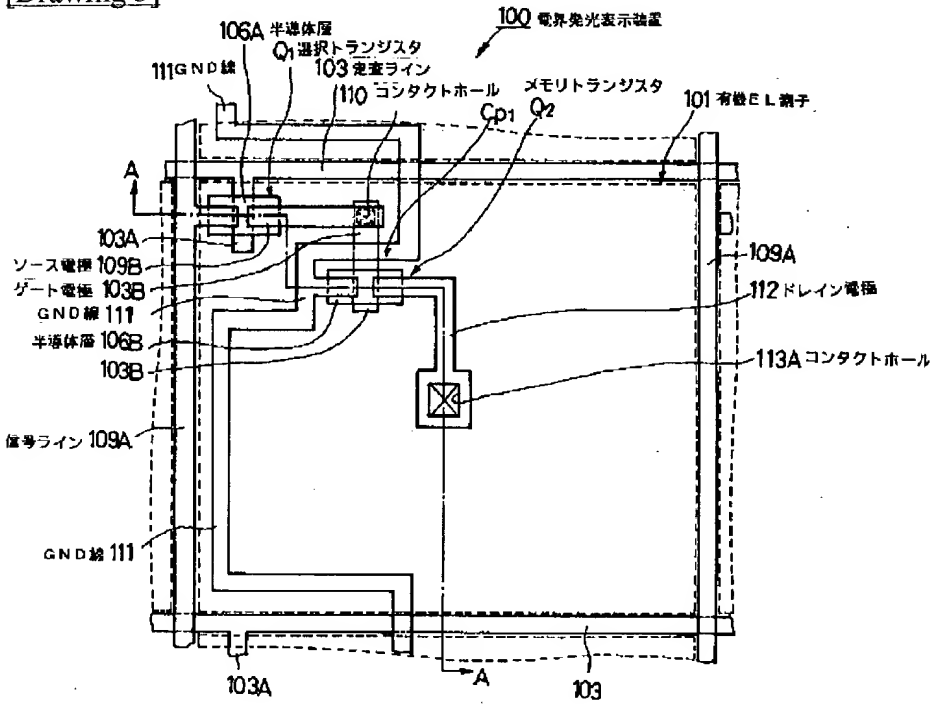
[Drawing 8]



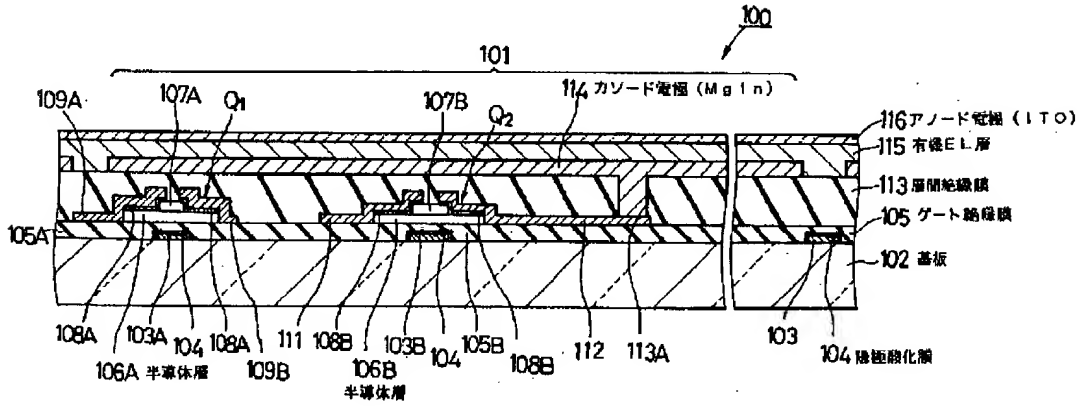
[Drawing 12]



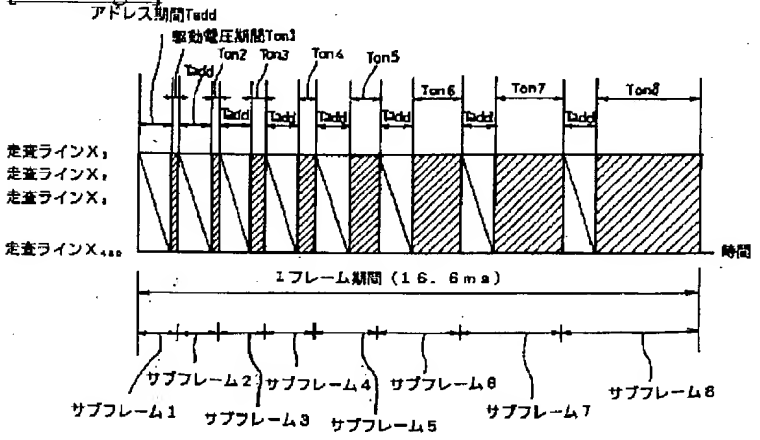
[Drawing 3]



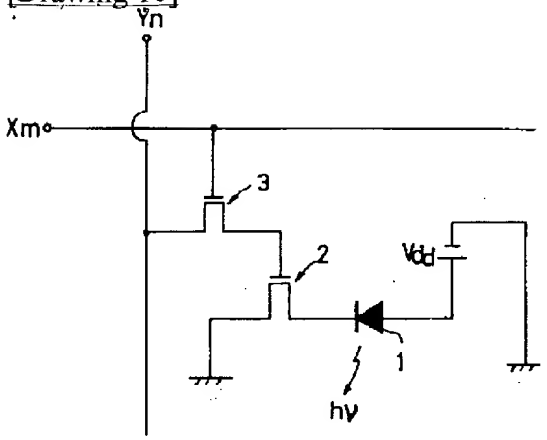
[Drawing 4]



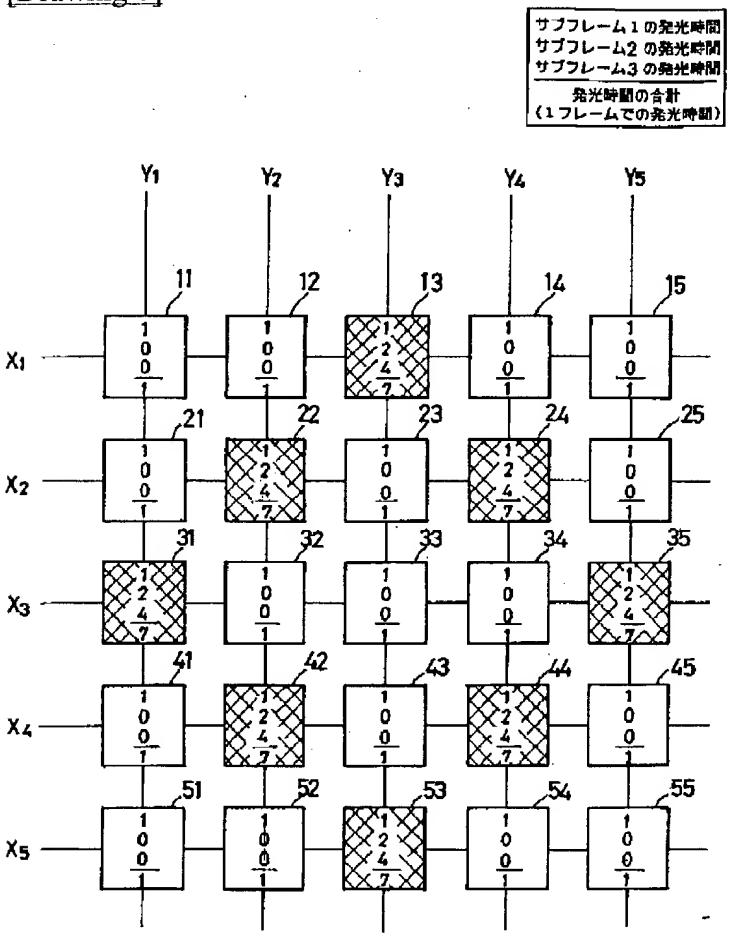
[Drawing 5]



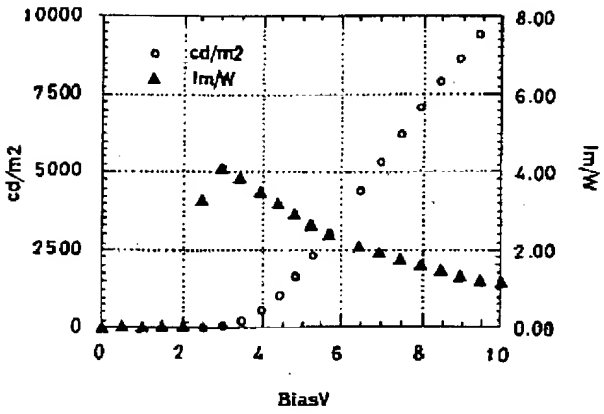
[Drawing 10]



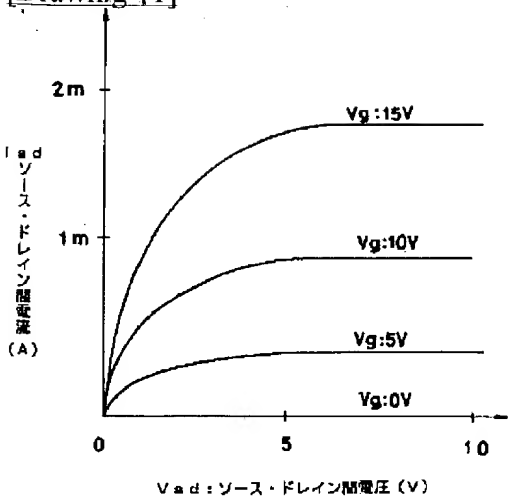
[Drawing 6]



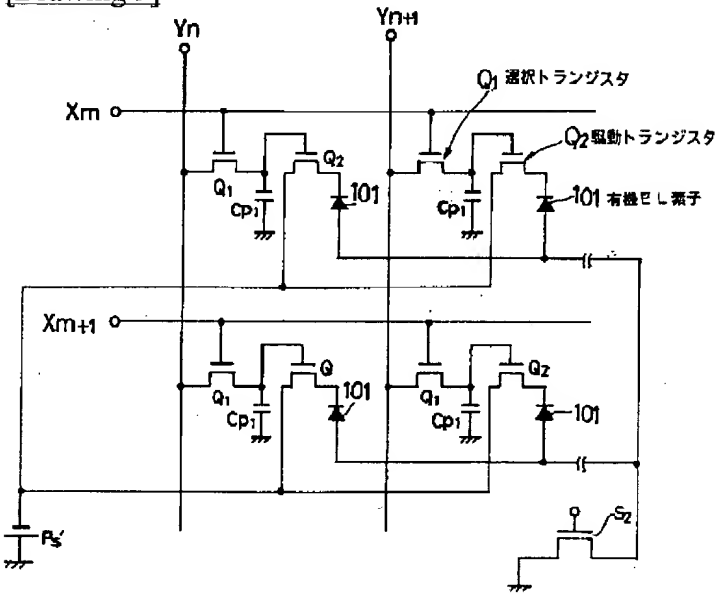
[Drawing 7]



[Drawing 11]



[Drawing 9]



[Translation done.]